NURSERY NOTES

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THE EFFECTS OF FIBRAMULCH APPLICATION RATES ON CONIFER SEEDBEDS

Introduction

Fibramulch[1] is extensively used during spring and fall seeding at Ontario nurseries because it is easy to use and relatively cheap in relation to other mulches. However, each mulch has its specific properties which influence bed temperature, germination, moisture retention and soil stability. Fibramulch does not provide as much protection to fall seeded beds as straw held in place by shades which gives higher seedbed densities and bigger seedlings than seedbeds treated with Fibramulch (Racey and Raitanen 1983). Conwed Hydromulch on the other hand has been observed to increase seedbed density of some western conifers (Landis *et al.* 1984).

It is important to develop appropriate management techniques which yield optimum results for whatever mulch is used. Past work has raised concern about the use of optimum application rates of Fibramulch (Racey and Raitanen 1983). The optimum rate will depend upon species differences such as seed size (Landis *et al.* 1984), spring versus fall seeding and whether mulching is combined with shades, frequent irrigation or other nursery practices.

This note reports the findings of a trial in which various application rates of Fibramulch were examined for effects on seedbed density and first year growth of red pine (*Pinus resinosa* Ait) and white spruce (*Picea glauca* (Moench) Voss) seedlings.

Materials and Methods

Fibramulch application rates were field tested on white spruce seedbeds at Kemptville nursery (45° 02'N, 75° 40'W) and on red pine seedbeds at Midhurst nursery (44° 27'N, 79° 45'W) in the spring of 1984. The Kemptville trial was seeded April 27 and mulched April 28 during warm and dry weather conditions. The Midhurst trial was seeded and mulched May 11 during wet weather with frequent heavy showers. The red pine seed at Midhurst was soaked in water for 12 to 16 hours before seeding. Both nurseries used a Hydroseeder with a 3632 litres of water (800 gal) capacity tank to apply the Fibramulch. The standard mulch mixture was 80 kg/tank at Kemptville and 48 kg/ha at Midhurst. A control and four application rates, based on tank mixture and tractor speed were applied in a latin square design in 5 adjacent nursery beds located near one end of a compartment (Table 1). Each plot was a 3 m long section of bed.

1 Manufactured in Canada by Park Lane Distributors Inc., 7 Kenhar Dr., Weston, Ont. M9L 1M9. The mention of brand names does not mean endorsement or recommendation in any way.

Germination was determined in each plot on July 4 at Midhurst and on August 7 in Kemptville. Soil temperatures were measured at a 5 cm depth on each plot at Kemptville, the week following mulching. No temperature measurements were made at Midhurst. The plots were observed throughout the growing season for signs of treatment differences in germination, growth and degree of soil stabilization.

A systematic, cluster sample of 25 seedlings was taken from each plot at each nursery in late fall. These seedlings were taken to the laboratory for stem caliper and oven-dry weight measurement. Germination count, soil temperature, stem caliper and top and root dry weight data were all analysed by an analysis of variance. Differences among means were compared with Duncan's new multiple range test.

Results and Discussion

The 48 kg Fibramulch per tank mixture gave a more uniform coverage at low application rates than 80 kg per tank. The heavier mixture tended to form clots which may lead to problems with the pumping mechanism of the Hydroseeder or an irregular dispersal of the mulch.

In the Kemptville trial, all application rates had significantly lower soil temperatures than the control treatment (Table 2). Fibramulch is fairly light in colour when applied, and probably reflects a substantial amount of sunlight, but it will probably also have some insulating effect. The temperature modifying effect of the mulch will be greater at the actual seed germination depth than at 5 cm. Landis *et al.* (1984) also observed that lower mulch application rates resulted in faster germination which they attributed to increased soil temperature.

The summer germination counts from both nurseries showed no significant difference among treatments. The mean densities (per 0.09 m^2 (1 ft^2)) ranged from 54 to 63 seedlings at Kemptville and from 37 to 41 seedlings at Midhurst. However, casual observations suggest that the germination rate was somewhat slower in the heavily mulched plots, which is an observation also supported by Landis *et al.* (1984) with wood cellulose mulch. White spruce stem caliper and dry weight of the tops and of the roots showed a significant decrease with increasing mulch application rate (Table 3). There was a 20% reduction in stem caliper and 30% reduction in weight between the heaviest application rate and the control. The control (no mulch) and the low rate of application (0.1 kg per lineal metre of bed or less) was the best application. These rates can be achieved with reasonable accuracy by using 48 kg per tank and a speed of 3.2 km/h (2 mph). We believe that the reason for this reduction in size is caused primarily by a longer germination period due to reduced soil temperatures.

The red pine at Midhurst was not affected by the application rate but rates were lower at Midhurst than at Kemptville. Also, heavy rain at Midhurst during the time of application caused much of the mulch to float and collect in furrows created in the bed by the seeder. Thus the results for red pine are harder to interpret.

Conclusion

These findings demonstrate the importance of properly testing new products and determining their effects on nursery productivity. Application rate of Fibramulch is easily controlled and significant gains in size of spruce seedlings can be made. However, soil stabilization properties must be maintained.

Additional work is required to determine optimum application rates of Fibramulch for all species used in Ontario because there is some evidence that mulching effects may be species specific (Racey and Raitanen 1983, Landis *et al.* 1984). The mulch should then be applied at the lowest level which provides optimum growth and adequate protection from soil erosion. There is some evidence that the low application rates required for good growth may not provide the needed degree of soil stabilization. If this is the case, we should examine our nursery practices, application procedures and additives to modify this mulching method to suit our purpose.

We would like to thank A.J. Campbell, K.H. Reese and the staff of both Kemptville and Midhurst nurseries for their assistance with these trials.

Literature Cited

Racey, G.D. and E. Raitanen. 1983. Seedling development as affected by fibre and straw mulching at Midhurst Nursery. Ontario Ministry of Natural Resources Nursery Note 94. 5 p.

Landis, T.D., J. Lott and J.A. Ives. 1984. Hydromulch increases seedbed density of some western conifers. U.S. Department of Agriculture – Forest Service. Tree Planters Notes 35 : 3-7.

Table 1. Tractor speeds and Fibramulch application rates for Kemptville and Midhurst nurseries. Kemptville nursery mixture used was 80 kg mulch per 3632 and at Midhurst it was 48 kg mulch per 3632 litres of water.

Treatment	Kemptville		Midhurst	
	Tractor speed km/h	Application rate kg per lineal metre	Tractor speed km/h	Application rate kg per lineal metre
Control (no mulch)	NA	NA	NA	NA
Low	6.4	0.10	6.4	0.032
Medium low	4.8	0.14	4.8	0.043
Medium high	3.2	0.20	3.2	0.064
High	1.6	0.40	1.2	0.170

Table 2. Soil temperatures at a 10 cm depth for the 5 days following mulching at Kemptville nursery.

Application rate	Soil temp. (°C)
Control (no mulch)	12 a
Low	10 b
Medium low	10 b
Medium high	8 c
High	10 b

Numbers followed by the same letter are not significantly different at the 95% level.

Table 3. Morphological measurements of 1 + 0 white spruce from Kemptville and 1 + 0 red pine from Midhurst as they relate to Fibramulch application rate. All observations are based on an average for 25 seedlings.

Treatment	Stem caliper (cm)	Root dry weight g	Top dry weight g
Midhurst red pine			
Control	0.188	3.19	7.27
Low	0.181	2.89	6.91
Medium low	0.180	3.14	6.99
Medium high	0.179	3.12	6.64
High	0.183	3.13	6.81
	n.s.	n.s.	n.s.
Kemptville white spruce			
Control	0.110 a	0.85 a	1.79 a
Low	0.103 ab	0.70 bc	1.57 ab
Medium low	0.100 b	0.78 ab	1.58 ab
Medium high	0.099 b	0.59 c	1.35 bc
High	0.091 c	0.59 c	1.23 c
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n.s. not statistically significant
** significant at 99% level
Numbers followed by the same letter are not significantly different at the 99% level.

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